Chapter 5 Procedures for finding the AFRTS digital satellite signals

The intent of this section is to aid in overcoming the difficulties of pointing a satellite antenna at an object 22,300 miles from earth. It contains step-by-step satellite dish pointing guidance, receiver set-up procedures and a trouble-shooting guide. It is understood there are varying degrees of experience in setting up satellite systems, so this is written as a general procedure. Take a couple of minutes to read and familiarize yourself with the content of this section before making adjustments to your system. If the dish is installed in military housing or where other AFRTS dishes are installed one can get an idea of the compass heading (azimuth) and elevation that others are using. It is important to understand that the dish must be accurately pointed and the set-top receiver correctly programmed before signals may be received.

There are currently four different models of digital IRD's: two consumer set-top models and two commercial quality rack mount models. Please be aware that there are setup differences and they are noted where appropriate though out this chapter. Appendix D of this document will list out the receiver settings for each receiver and area around the world.

Obtaining your site Azimuth and Elevation

Aiming a satellite antenna is basically the same principle used to aim a TV antenna, with just a few new terms to deal with. Direction to a satellite from an earth station site is typically expressed as "Azimuth", the compass heading East or West in the site horizontal plane, and "Elevation", the angular amount up from the site horizon, or the angular amount of tilt. The larger the antenna, the more critical it becomes to aim accurately, but offers more gain and therefore better signal reception. If you can't find information in appendix C regarding your site azimuth and elevation, call HQ AFRTS at commercial (703) 428-0268, DSN 328-0268 or the AFRTS-BC 24 hours a day at commercial (951) 413-2236, DSN 348-1236.

Step One: IRD Authorization

The first step in getting your IRD to work is to have its Tracking Identification (TID) number entered in the AFRTS decoder database by logging into https://pvconnect.net, if Internet service is not available call AFRTS-BC 24 hours a day at (951) 413-2339, DSN 348-1339 or AFRTS-HQ during normal working hours east coast time at (703) 428-0616, DSN 328-0616.

Step Two: Finding a Clear line of Sight

(a) Two tools are required to survey your site location, a magnetic compass, and angle locator. If you can't locate an angle finder gauge see figure 5-6, "Use of Protractor".

(b) Go outside to the antenna site and hold your compass flat in your hand. Rotate the compass to get the "N" (north) and the pointer to align, see

figure 5-1. You should keep the magnetic compass away from metal when using it.

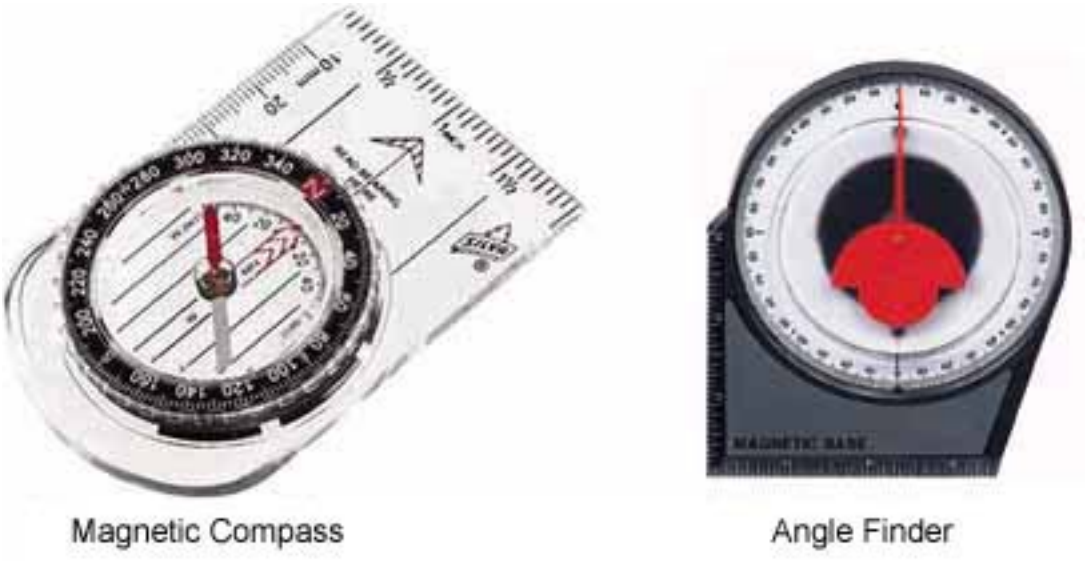

Figure 5-1 Satellite Pointing Tools

(c) Locate the mark on the compass that corresponds to the azimuth number for your location. Satellites are located in space above the earth's equator so you generally must aim toward the equator. Appendix D contains look angles for many locations around the world. They are all based on magnetic headings.

(d) Point or aim in the direction of your azimuth setting.

(e) Raise your arm to approximately the elevation angle, use angle gauge for reference. This is the direction and elevation of your antenna. Sight down your arm to ensure a clear path. Trees or buildings should not block your antenna; otherwise your site will not be a suitable location. Trees will block the signal so take into consideration their future growth.

(f) At this point exact aiming is not important the dish is being pointed in a general direction to allow for the installation of connection cables.

Step Three: Connecting the Antenna and Receiver

(a) Locate the receiver (IRD) and TV/monitor beside the antenna for aligning purposes. Running an AC power cord out to the antenna site will make the task of finding the satellite and peaking the signal much simpler.

Figure 5-2 Installation Parts

(b) Connections from receiver to antenna are made using RG-6 coax cable and “F” type connectors. Thinner RG-59 coax cable can be used at lengths up to 50ft. or less, but is not recommended for longer runs due to the amount of signal lost. “F” type connectors should be of the compression type to ensure a good shield/ground connection. These compression connectors require a special tool for assembly. Pre-assembled RF cables are available for purchase in common lengths. Only finger tighten the connections. Leave enough slack in the cables so that the dish may move back and forth and up and down.

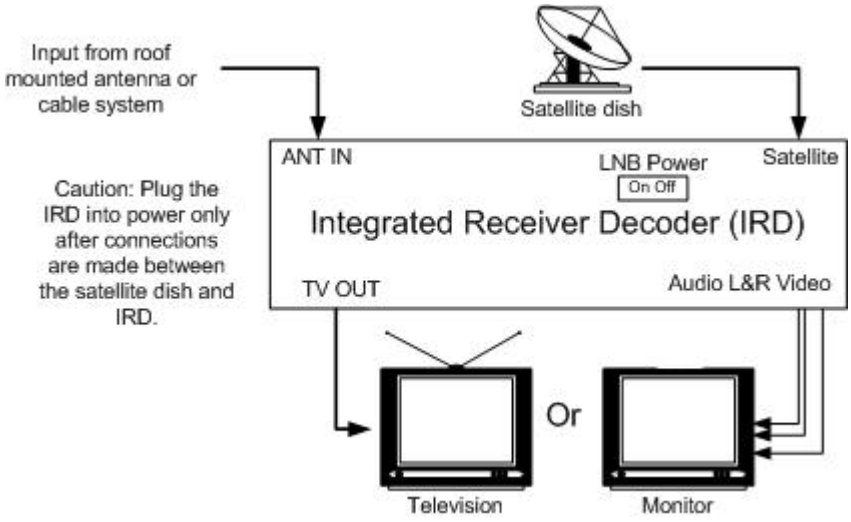

Figure 5-3 IRD Connections

NOTE: It is extremely important and cannot be over emphasized the importance of quality cabling and connectors; this is a must. The move to the digital world has made us aware of the necessity for quality workmanship and the penalties paid if neglected. If ignored, expect to have problems with your system having occasional interruptions and possibly total loss of service. On the other hand, if your installation is a

quality one, as it should be, the benefits are cleaner video and compact disk equivalent quality audio.

(c) Connections from the 9234 or 9834 set top IRD model receiver can be made using standard RCA audio and video cables in the case of a monitor or RG-59 coax cable for RF connection in the case of a television. On the 9234 models the change the LNB power located on the back of the receiver to the “on” position. For the 9223 switch it to the 19 (left) for C-band (DTS and SatNet) users and to the 13/19 for Ku-band (Hotbird and Pacific Direct to Home) users. For the model 9834 the setting is done in software. Appendix D has the technical details on antenna requirements and receiver polarization menu settings.

Initial Antenna Setup and Adjustments

Figure 5-4 Antenna angle display

(d) At this point you should have made all electrical and mechanical connections and know your azimuth and elevation settings. On most satellite antenna mounts there is a scale that will read the elevation of the antenna, set your site elevation using this scale. It is critical that the antenna be mounted straight up and down for this scale to be accurate enough to set the antenna on the correct elevation. If not, your azimuth and elevation adjustments will be off by the amount of error that’s induced by the installation of the mount. Just to give you some kind of idea of the accuracy required, a one-inch movement of the lip of a 5-foot antenna results in a full degree misalignment in the antenna’s direction. An error of that magnitude will certainly make the difference between an excellent signal and no reception at all. Satellites are spaced at only two degrees apart; therefore, it is very easy to be on the wrong satellite. If you do not have an elevation scale on the antenna mount, you can buy an angle meter/gauge at hardware stores, from the Internet, or lumber yards. If you cannot locate an angle gauge, you can make your own see figure 5-5 to use a common protractor.

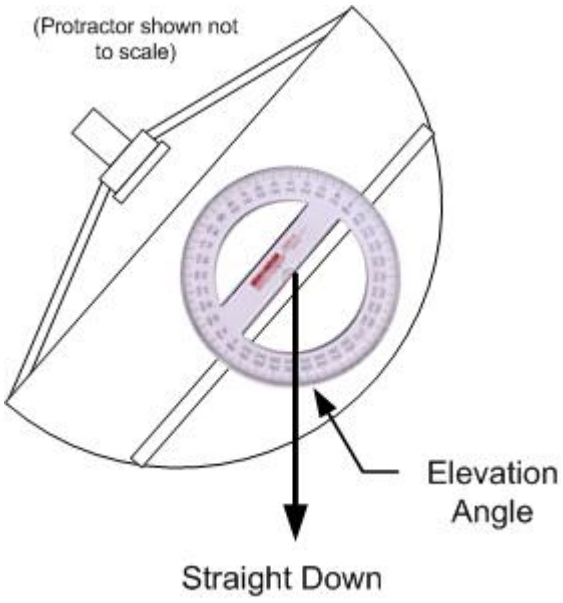

Figure 5-5 Look angle adjustment

This is a good time to note; if you ever see the Signal State change from No Lock to Lock + Sig, whatever you do, do not change your antenna position. The signal status will not change to Lock + Sig unless your receiver is locked to the AFRTS satellite signal. Even after you go to the main menu and the IRD will not authorize, still do not change the antenna position, you may have other problems. Slight adjustments to improve the signal are discussed in Step 5.

Step Four: Locating the Satellite

(a) If you haven't already done so, locate your satellite receiver and TV close to the antenna and connect as shown in figure 5-3.

(b) If you have a spectrum analyzer, connect it to the antenna. A spectrum analyzer is an expensive and complex piece of test equipment normally found at a television station but normally not used by home installations. See Table 4-1 for analyzer setup details.

(c) Switch the TV/Monitor and Receiver power to the on position and tune the TV to view the receiver (IRD) menu screen.

(d) Perform decoder setup instructions found in this back of this chapter. Information for all regions served by SATNET and DTS can be in appendix C. It is best to begin with the IRD set at the "Installer Menu" for the 9223, the "Receiver Setup" menu for the 9234, and the "Preset and LNB Setup" menu for the 9834.

Basically you need to know which signal you want to use and then adjust the receiver to the proper parameters. The 9834 has built-in presets to assist you with this process.

The green signal LED on the front of the IRD and the Signal Status menu are the first and most reliable indicators of receiving the satellite signal. It is best to use the signal status menu window for signal verification during the antenna tuning process. On the 9834 the signal LED is located near the center of the display and will light when the signal is locked in and authorized, blink when the signal is locked in but not authorized, and not light when no signal has been found.

(e) Set the elevation on your antenna using the scale located on the back of the antenna or use the protractor method if the antenna is not marked. Note: when adjusting the elevation angle of an offset dish, subtract the manufacture's offset angle from the elevation angle provided for reference.

You'll have to do this if using the protractor method. Most offset dish manufacturers supply a gauge on the antenna mount that automatically makes this correction for you, see figure 5-4.

(f) If necessary, loosen the nuts on the antenna support pole so that the antenna can rotate easily left and right.

(g) Hold the compass flat in the palm of your hand away from the antenna and any large metal object.

(h) Rotate the compass so that the "N" (North) is under the dark point of the compass pointer or arrowhead, see figure 5-6.Your compass is now aligned with the north and the marks around the edge of the compass represents azimuth degrees.

(i) Locate the mark on the compass that corresponds to the azimuth number for your site location.

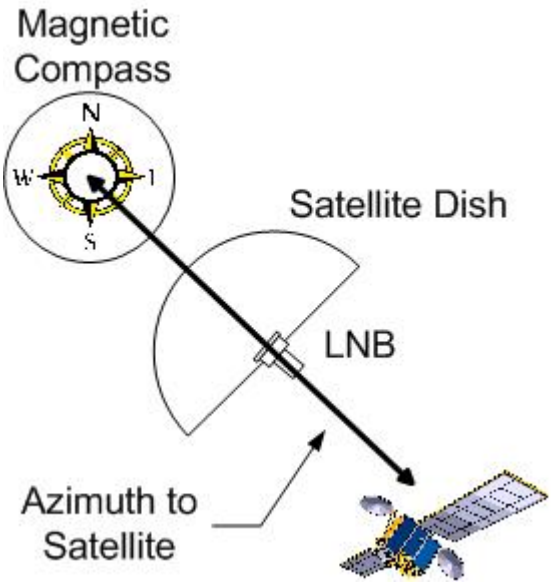

Figure 5-6 Azimuth setting

(j) Swing the antenna in the direction of your azimuth (compass) heading, use the LNB that sticks out from the dish center as your pointer. Try to make this adjustment as accurately as you possibly can. It usually helps to pick an object that is several hundred feet away from your antenna that aligns with the antenna mounting pole and your azimuth heading, see figure 5-6.

(k) After making azimuth adjustments, to prevent the antenna from moving, lightly tighten those bolts down.

If you are lucky enough to have a locked signal at this point, exit from the Installer/Receiver Setup Menu to the main menu and set the IRD to a known video channel. The IRD will not authorize immediately, so give it a couple of minutes to do so. If after a couple of minutes the IRD does not authorize, check the customer settings in appendix D for your region and see step six for troubleshooting. As indicated above, Lock + Sig is proof that your antenna is locked on the satellite. All other problems are associated with the IRD setup or authorization in the AFRTS database.

Step Five: Peaking the Antenna

(a) Perform this procedure only after getting Lock + Sig in the Installer or Receiver Setup menu. If no Lock + Sig go to step seven.

(b) Mark your antenna's azimuth and elevation settings with a magic marker pen for reference. This is done as precaution, just in case you totally loose the signal during the fine-tuning phase.

(c) Slowly tilt the antenna forward and backward (elevation) and set for maximum "Signal Level" and "BER/Signal Quality" levels moving the antenna's edge by just a half and inch or less. Signal quality or BER is the most important to maximize. Remember, BER of 0.0 E-2 is bad and 0.0 E-6 is perfect, and Signal Quality 1-10, with 10 being the best.

(d) Do the same for azimuth, left and right again moving the dish in very slight amounts.

(e) Repeat steps 2 and 3 at least two times each.

(f) Tighten the bolts down with a wrench to prevent movement.

Step Six: Troubleshooting

If the Signal State is not displaying Lock + Sig do the following:

(a) Check to see if the LNB Power switch on the back of the set is set to the ON position for a 9234. For a 9223, the IRD has three Power positions: 19, OFF, and 13/19 Volt positions, do the following, for C-band users set it to the 19 Volt position, for Ku-band users set it to the 13/19 Volt position. On the 9834 the voltage is controlled by the software in the menu PRESET & LNB SETUP.

(b) Also, ensure your antenna is polarized correctly for the signal you intend to receive. Note: For Ku-band users (direct to home customers in Europe, Japan and Korea) the receiver voltage can switch the antenna polarization from vertical to horizontal within the receiver setup menu (13 Vertical-19 Horizontal).

(c) If this was your problem, the green signal light on front of the IRD will illuminate. Go to the Receiver Setup or Installer Menu and check to see if the No Signal state has change to Sig+Lock.

(d) If you have Sig+Lock, go back to Step 5 and following those instructions.

(e) If this was not your problem, it is time again to check the antenna position; perform the following:

1. If you have a spectrum analyzer connect it per directions in Table 4-1.
2. For those that do not have the luxury of test equipment, position your TV and IRD so you can work on the antenna and monitor the receiver status at the same time.
3. Check the azimuth and elevation and reposition as needed. Use very small movements up and down, left and right. Remember that small adjustments will move you among satellites. You should be moving the dish one quarter to a half and inch measured at the edge at a time. If

the signal level increases significantly with No lock + Signal, you are on the wrong satellite or the setup parameters are wrong.

4. Remember at any time during the following procedures you get a locked signal (Lock+Sig) stop and mark the antenna's azimuth and elevation positions. If yes go back to "Peaking the Antenna" if no proceed to next step (e).
5. The following is a slow process but will result in aligning your antenna.
6. Loosen antenna-mounting bolts so that you can move the antenna's azimuth (east and west).
7. While monitoring the Signal State (No Lock) slowly move the antenna from east to west. Again, if the signal state ever changes to Lock+Sig, stop and lock the antenna in that position and perform "Peaking the Antenna".
8. This is a long and time-consuming process to follow and adjustments must be made in slow, small increments. Reset the antenna's elevation by repositioning by less than one degree, tilting it in ½ inch increments, locking it down and repeating step 12 (move slowly, east to west).
9. Repeat Step (7) and (8) until you have a LOCKED (Lock+Sig) signal.
10. Once you obtain a locked signal, mark the antenna's azimuth and elevation with a permanent marker for future reference.
11. After getting a LOCKED signal reposition the antenna's azimuth and elevation to maximize the signal level, BER, and Signal Quality. Note: Set the 9234 or 9834 for the best signal quality (1-10, 10 being the best) and set the 9223 for the best BER (E-2 is bad and E-6 being the best). Also, see Step 5 "Peaking the Antenna".
12. Go back to "IRD Displays Sig+Lock" and perform that procedure; also see the "Antenna Peaking" section.

Decoder Setup Instructions Scientific Atlanta PowerVu (Model 9223)

Appendix D of this document is required to set the receiver decoder as it contains parameters to enter into the receiver decoder based on your geographical location.

1) Unpack the receiver decoder from the shipping box and install either in a rack or on a tabletop. Warning: if installed on a tabletop, do not stack units on top of each other, as heat buildup will cause the units to fail. Allow a minimum of 2 inches of air space between receivers in racks.

2. Connect the L-band RF output from your LNB to the IRD RF IN connection.

3. Turn the LNB power switch located on the rear of the IRD to the 19V DC setting.

4. Connect a video cable from the Video Out connector on the rear of the IRD to the Video input on the rear of the TV monitor. Connect audio cables from the L-R Audio Output connectors on the rear of the IRD to L-R Audio Input connectors on the rear of the TV Monitor.

5. Connect the IRD to the AC power source. A green dot will appear in the center of the front panel display window. Push the on/off switch, located on the front lower left of the IRD, to turn the IRD on. Select Channel 0.

6. On the front panel keypad, press MENU.

7. Press 2, to unlock the installer MENU.

8. Press 9 to bring up the first page of the installer MENU.

NOTE: The INSTALLER MENU consists of two pages of selectable settings for transponder frequency and other vital decoder specific parameters including a preset frequency plan. You can exit this menu at any time by pressing VIEW.

9. Press CHAN UP/DN on the front left portion of the IRD to change the Band setting to appropriate setting for your satellite region. (See PowerVu setup information in appendix D of this document).

10. Press NEXT on the front keypad to select L/C-band Freq setting on the menu screen. Using the keypad enter the correct L/C-band frequency setting for your satellite region. (Refer to appendix D)

11. Scroll to the Polarization block, push the SELECT button to enter H (fixed).

12. Press NEXT to move the arrow down to the FEC RATE. Using the channel up/down keys enter the correct FEC RATE for your satellite region. SatNet users should select ¾ and DTS users should select 2/3.

13. Press NEXT to select SYMBOL RATE. Using the keypad enter the correct SYMBOL RATE for your satellite region. (Refer to appendix D)

14. Press YES on the front keypad section and note the system will respond that it is saving the entries in the upper right of the TV monitor. NOTE: Failure to save entries will result in the system reverting to the factory default settings and the IRD will not authorize.
15. Double check the changes you made to page 1 of the installer MENU comparing the settings with those listed in the PowerVu setup data for your satellite region.
16. Press USER to select page 2.
17. Press NEXT to select NETWORK ID.
18. Using the keypad enter the NETWORK ID for your satellite region. (Refer to appendix D)
19. Press YES to save the changes.
20. Press USER to return to page 1, at this time the word LOCKED should appear next to the bit error rate line if you're pointing to the correct satellite and have a good signal.
21. Press VIEW to return to channel 0.
22. Press CHANNEL UP/DN to toggle through each available channel. Then press the standBy switch once. If your system requires a software upgrade, it will begin automatically. Allow the system to totally download the updated software. (Download procedure could take up to 30 minutes) Once the download is complete the decoder will return to normal operation on the last channel that was selected prior to beginning the download.

Important note: all C-band LNB's have a local oscillator (L.O.) frequency of 5.150 GHz but Ku-band LNB's may come in many different frequencies typically 9.750 to 12.75 GHz. This means that if you're attempting to watch a Ku-band service you need to set the decoder's frequency using a bit of simple math. The formula to set the Ku-Low/Single L.O. frequency on the AFRTS decoder is the downlink frequency minus the L.O. frequency. As an example the downlink frequency for the IntelSat 804 satellite serving the Japan and Korea Direct to Home service area is 11.6380 GHz. An LNB with a local oscillator frequency of 10.000 GHz would give a Ku Low/Single L.O. frequency of 1638 MHz (1.638 GHz) by working the math problem 11.16380 – 10.000 = 1.638. The Ku-band satellites serving the European service area are HotBirds 6 and 7a at 13 degrees east and it has a downlink frequency of 10.775 GHz. Connecting an LNB with a local oscillator frequency of 9.750 would result in a receiver frequency of 1025 MHz (10.775 – 9.750 = 1.025 GHz which is 1025 MHz).

Decoder Setup Instructions Scientific Atlanta PowerVu (Model 9234)

The following are quick set-up instructions for Scientific-Atlanta's Integrated Receiver Decoder (IRD), Model #9234 (hereafter referred to as an IRD).

SET UP INSTRUCTIONS:

1. Unpack the IRD from the shipping box and install either on a desktop or on top of TV receiver. Do **not** plug the IRD into the power outlet yet.
2. Connect the L-band RF output from your satellite dishes LNB to the IRD's RF IN connection.
3. Turn the LNB power switch located on the rear of the IRD to ON.
4. If you are using a TV Monitor (a TV without ability to change channels), connect a video cable from the Video Out connector on the rear of the IRD to the Video input on the rear of the TV monitor. Connect audio cables from the L-R Audio Output connectors on the rear of the IRD to L-R Audio Input connectors on the rear of the TV Monitor.
5. If you are using a TV Receiver (a TV with ability to change channels), connect a coaxial cable from the TV Out connector on the rear of the IRD to the VHF input on the TV. Select either TV channel 3 or 4 on the rear of the IRD and select that channel on your TV.
6. Connect the IRD to a power source. Push the on/standby switch, located on the front lower left of the IRD, to turn the IRD on.
7. Using the remote control, display the BSR MAIN MENU by pressing the Menu button. See Figure 4-8 for example.

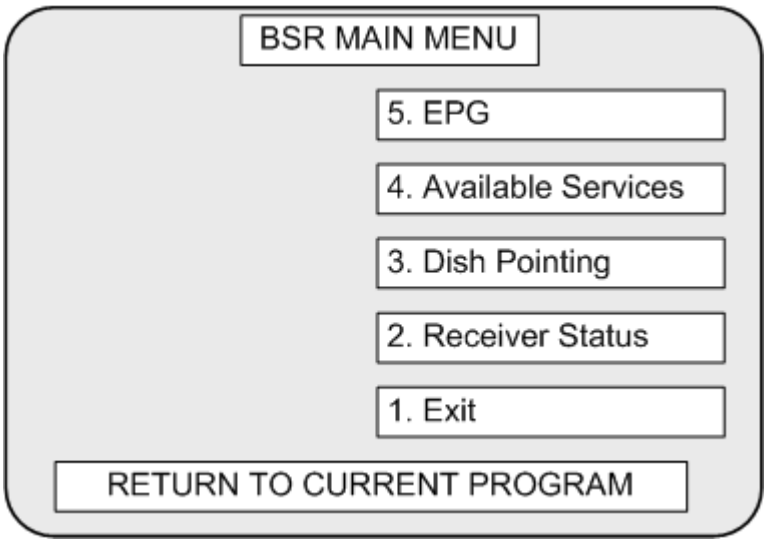

Figure 5-7 BSR Main Menu

8. Display the RECEIVER STATUS MENU by pressing 2 and then SELECT, or move to Receiver Status using the scroll arrows on the remote control and press SELECT. See Figure 4-9 for example.

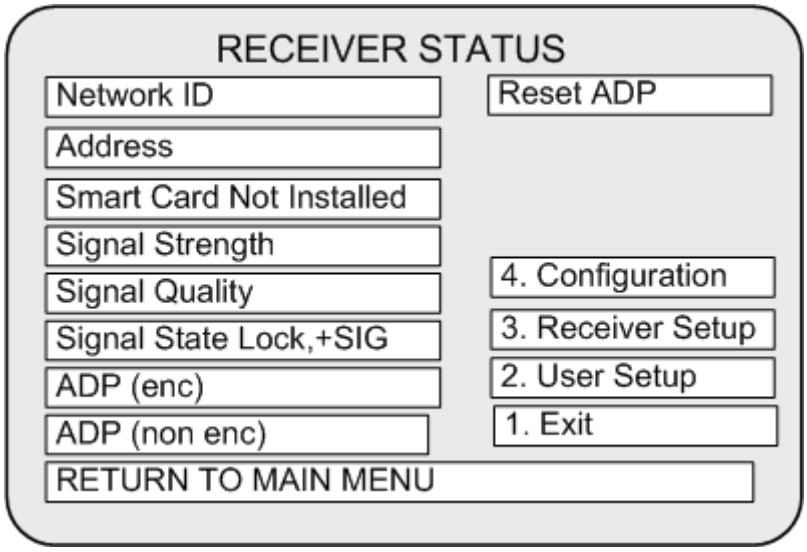

Figure 5-8 Receiver Status Menu

9. Display the RECEIVER SETUP MENU by pressing 3 and then SELECT, or move to Receiver Setup using the scroll arrows on the remote control and press SELECT. See Figure 4-10 for example.

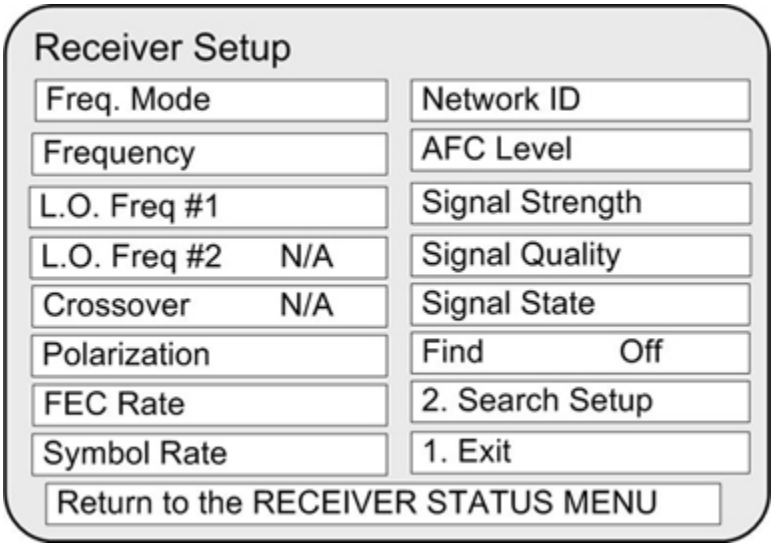

Figure 5-9 Receiver Setup Menu

10. Once in the RECEIVER SETUP MENU (as shown in figure 4-10), scroll to the Freq Mode block and set to L-band/#1 using the SELECT button.
11. Scroll to the L.O. Freq # 1 Block, push SELECT button to clear the entry, enter the appropriate L.O. Freq for your satellite region (See PowerVu setup information in appendix D)
12. Scroll to the Frequency block, push SELECT button to clear the entry, enter the correct frequency for your satellite region. (See PowerVu setup information in appendix D) Push the SELECT button to store (save) the Frequency block setting. The L.O. Freq. #2 and crossover blocks should be set to N/A.
13. Scroll to the Polarization block, push the SELECT button to enter H (fixed).
14. Scroll to FEC Rate block, push SELECT button to enter appropriate FEC Rate for your satellite region. SatNet users should select 3/4 and DTS users should select 2/3. Do not push SELECT button at this time.
15. Scroll to the Symbol Rate block, push SELECT button to clear the entry, enter the appropriate Symbol Rate for your satellite region. (Refer to appendix D) Push the SELECT button to store (save) the setting.
16. Scroll to the Network ID block, push SELECT button to clear the entry, enter the appropriate Network ID for your satellite region. (Refer to step 20) Push the SELECT button to store (save) the setting.
17. Scroll to the Exit block and push SELECT. (A yes/no box to store settings will appear.) Push 1 to store the settings. This will return you to the Receiver Status Menu. Scroll to the Exit block on this menu and push the SELECT button. This will return you to the BSR MAIN MENU. Scroll to Exit and push the SELECT button. This will return you to normal viewing.

18. Virtual channels can be selected using the remote control or the channel up/down switch located on the front of the IRD. Enter a channel number, e.g., 01 and push SELECT from the remote. Then press the standby switch once. If your system requires a software upgrade, it will begin automatically. Allow the system to totally download the updated software. (Download procedure could take up to 30 minutes) Once the download is complete the decoder will return to normal operation on the last channel that was selected prior to beginning the download.
19. Local off-the-air reception is available through the IRD. Refer to page 3-5 of the IRD installation manual for connecting for off-air reception.
20. Note: the remote control must have unobstructed line-of-sight to the IRD for proper operation.

Important note: all C-band LNB's have a local oscillator (L.O.) frequency of 5.150 GHz but Ku-band LNB's may come in many different frequencies typically 9.750 to 12.75 GHz. This means that if you're attempting to watch a Ku-band service you need to set the decoder's frequency using a bit of simple math. The formula to set the Ku-Low/Single L.O. frequency on the AFRTS decoder is the downlink frequency minus the L.O. frequency. As an example the downlink frequency for the IntelSat 804 satellite serving the Japan and Korea Direct to Home service area is 11.6380 GHz. An LNB with a local oscillator frequency of 10.000 GHz would give a Ku Low/Single L.O. frequency of 1638 MHz (1.638 GHz) by working the math problem 11.16380 – 10.000 = 1.638. The Ku-band satellites serving the European service area are HotBirds 6 and 7a at 13 degrees east and it has a downlink frequency of 10.775 GHz. Connecting an LNB with a local oscillator frequency of 9.750 would result in a receiver frequency of 1025 MHz (10.775 – 9.750 = 1.025 GHz which is 1025 MHz).

Decoder Setup Instructions Scientific Atlanta PowerVu (Model 9834 and 9835)

Both the 9834 and 9835 receivers are pre-loaded with data in pre-set locations to aid you in setting up either receiver. Use the proper pre-set for the signal you are attempting to view. You will need to record the LO frequency – the Local Oscillator frequency of the LNB that you are using. This is typically a number like 9.75 GHz to as high as 12.75 GHz. The 9834 receiver has an additional high-speed data port and an Ethernet output which are used by AFRTS affiliates to receive data files addressed to their decoder.

1. Unpack the receiver decoder from the shipping box and install either in a rack or on a tabletop. Warning: if installed on a tabletop, do not stack units on top of each other, as heat buildup will cause the units to fail. Allow a minimum of 2 inches of air space between receivers in racks. Do not plug the power cord into the AC outlet at this time.
2. Connect the RF output from your satellite dish LNB to the SATELLITE LNB POWER connection on the rear panel on the left hand side of the IRD.
3. Connect a video cable from the VIDEO connector on the rear of the IRD to the Video input on the rear of the TV monitor. Connect audio cables from the L-R AUDIO output connectors on the rear of the IRD to L-R Audio Input connectors on the rear of the TV Monitor. Alternatively you can run a cable from the TV OUT connector on the IRD to the RF input on a television. Signal quality isn't quite as good as using the separate video and audio cables and the television set must be tuned to 3 or 4 (channel 3 is the default).
4. Plug the IRD into AC power and wait for about 1 minute while the receiver is booting up before continuing on. While the receiver is booting up, the front panel display will show APP and a number representing the current application code version. This sequence will stop once the receiver is ready for operation.
5. On the front panel or using the remote control, press MENU. The main menu should be displayed on your television or monitor's screen as shown in figure 5-10.

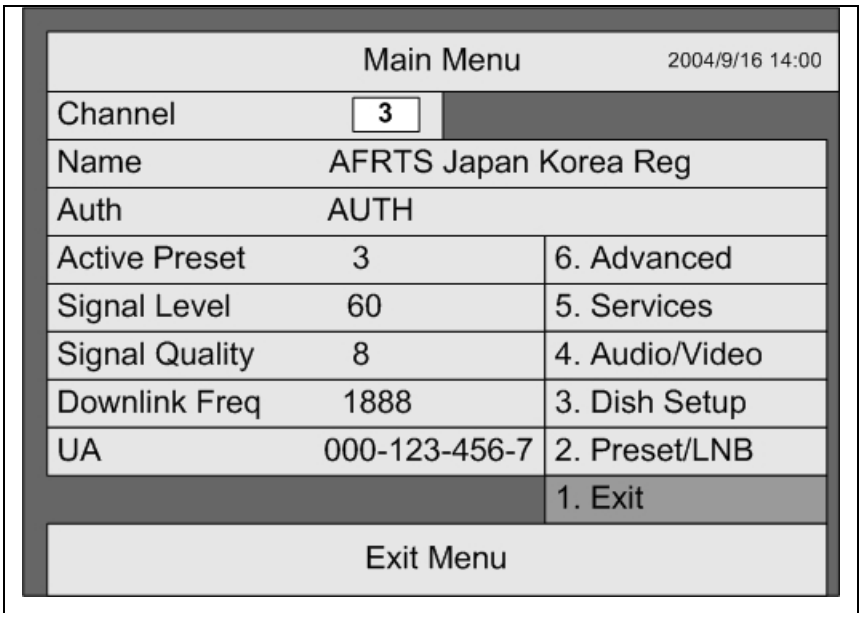

Figure 5-10 9834 IRD Main Menu

6. Use the up and down arrows on the front panel or the remote to select the PRESET & LNB SETUP or press the number 2 on the remote control and then press SELECT.
7. Cursor over using the left and right arrows to high light the LNB Pwr. Press SELECT and then the up and down to choose POLARISER which is the automatic mode. Press SELECT again to set the LNB Pwr to POLARISER. The screen should now appear similar to figure 5-11.

Figure 5-11 Preset and LNB Setup Menu

Note: *Far East viewers using pre-set 3 will have to change the downlink frequency to 11.676 as shown in figure 5-11.*

8. Use the up and down arrows to cursor down to the LO Freq 1 and press select. Enter in the LO frequency recorded from the LNB. Press SELECT to accept the numbers you entered. You can either use the arrow up or down key to change the numbers or enter them in directly using the number buttons on the remote control. Press select to accept the number. LO Freq 2 doesn't need to be set.
9. Use the left and right arrow key to cursor over to the ACTIVE setting and press SELECT. Use the up and down arrow keys to select the proper pre-set from the table 5-1 below. Press SELECT again to set the proper pre-set into use.

Pre-set number	Signal	Region
1	AFRTS (Hotbird)	Europe
2	Not used	NA
3	AFRTS	Japan and Korea*
4	DTS	Pacific Ocean
5	DTS	Atlantic Ocean
6	DTS	Indian Ocean
7	AFRTS	Atlantic Ocean
8	AFRTS	Domestic US
9	DTS	Domestic US
* Pre-set requires some modification see Appendix D.		

Table 5-1 IRD Pre-sets

10. Make sure that the ACTIVE pre-set matches your desired selection and then use the arrow keys to cursor over to EXIT or press the 1 key on the remote and then press SELECT to return to the main menu. Note the PRESET setting has no effect on how the IRD decodes the signal – only the ACTIVE setting has effect.
11. From the MAIN MENU cursor up to DISH SETUP and press select.

Figure 5-12 Dish Setup Menu

12. If the dish is aligned correctly you will see maximum indications on both SIGNAL QUALITY and SIGNAL LEVEL and should hear a steady high pitched tone from the television's speaker. SIGNAL LOCK should display YES. See the section earlier in this chapter on peaking the satellite signal and later in this chapter for trouble shooting if the SIGNAL LOCK doesn't read YES.
13. Exit from the menu by selecting EXIT from the DISH SETUP and MAIN MENU's.
14. Press CHANNEL UP/DN to toggle through each available channel. Then press the on/standby button once. If your system requires a software upgrade, it will begin automatically. Allow the system to totally download the updated software. (Download procedure could take up to 30 minutes) Once the download is complete the decoder will return to normal operation on the last channel that was selected prior to beginning the download.

Caution: do not unplug the LNB signal or the AC cord, nor move the dish while the IRD is downloading application data. Shipboard users are advised to accomplish the update while pier side when ever possible.

T*roubleshooting Guide*

Satellite integrated receiver decoder will not turn on.

(1) Check to see if the receiver is plugged in to the wall jack.

(2) Try plugging the receiver into a different electrical outlet. Be sure you're not plugged into a "half hot" or "switched" outlet controlled with a light switch.

(3) Plug your TV into the same outlet and see if it will power on.

(4) Make sure the problem is not with the receiver. Turn on the receiver both from the front panel and with the remote.

(5) Check the fuse box circuit breaker.

I cannot set the receiver to the on-screen menu.

(1) Check to see if your TV is tuned to the correct channel either channel 3 (default) or 4 and select the same on the back of the receiver.

(2) Check to see if you are using the correct connections from the Receiver to the TV. Are you using the RF (To TV) connection and connected to the "from antenna on the TV". Are you connected to the Video output from the receiver, to the video input on the TV/monitor.

(3) If you are using the RF connection from the receiver to the TV, tune to channel 3 or 4.

(4) Turn the receiver on from the remote or the front panel.

(5) In the receiver setup menu select NTSC.

I cannot pick up the satellite signal

(1) Have you gotten your receiver authorized?

(2) Check that all signal connections from antenna, receiver, and TV are correct.

(3) Make sure there are no obstructions blocking the antenna's view to the satellite. Always stand behind the antenna, not in front while checking. Vegetation like bushes and trees will block the satellite signal.

(4) Check that the antenna is set to the correct polarity, for example, horizontal, vertical, left hand circular or right hand circular.

(5) Check the antenna azimuth and elevation settings, if wrong see "Antenna Pointing".

(6) Tune the receiver to the "Receiver Setup Menu" on the 9234 and 9834, the "Installer Menu" on the 9223, or the "Dish Setup" and the 9834 and 9835 receiver model. If the signal indicator reads Sig+Lock, check the following for your location and service. If all of the settings below are correct; chances are good that your decoder isn't authorized in the AFRTS decoder database; call for authorization – see this chapter's "IRD

Authorization". Use appendix "D" to check these parameters. On the model 9834 ensure that the proper pre-set setting is being used for your region.

a. Network ID

b. FEC Rate

c. Frequency

d. Band

e. L.O.

f. Polarization

g. Symbol Rate

h. Video Standard is (NTSC)

(7) If the signal indicator in the "Receiver Menu" reads No Signal check the cable from the antenna to the Receiver.

(8) "Reboot" your IRD. Turn off the IRD using the remote control and then unplug it from the electrical power. Wait a minute and then plug the IRD back in and turn it on.

(9) Rarely you might be attempting to receive the signal during either a sun outage or a signal outage caused by a technical problem at the up link site. These outages would affect an entire region at once so your neighbors and other service members at your command would have also lost signal. An easy check is to see if the signal is available at another receiver in your same location. A sun outage lasts only 10 to 15 minutes. Sun outages over the United States can affect signals in elsewhere in the world.

I was receiving the satellite signal but it comes and goes or I get a lot of freeze frames and digital artifacts.

This is the sign of a weak signal and can usually be traced to one of the following problems:

(1) Poor connection from the Antenna to the Receiver. Wiggle the connections to see if you can get the signal to intermit from Loss of Signal to Freeze-Frames. If so, redo or replace connectors.

(2) Antenna is not peaked for best signal strength or is too small for your area. See the section of this chapter on signal peaking. Your dish should be at least the same size as other's who are watching AFRTS.

(3) LNB does not meet specifications. This typically happens with a new LNB that has replaced a failed on or one from a brand new installation. Heat and cold will often cause a marginal LNB to lose signal.

(4) Poor quality cable or connectors in use or impedance mismatch. Make sure that you are using the proper RF cabling between the LNB and the

receiver. Computer network cable is the wrong electrical impedance and will cause signal loss.

(5) Signal level input to the IRD is too high; optimum input is –42 dBm. This is very rare.

(6) Antenna is not stable; wind moves or shakes the antenna excessively. Extreme weather will cause the satellite dish to move off the satellite's position.

(7) Terrestrial Interference. Typically caused by radio transmitters located in front of the dish.

(8) This could be caused by a regional sun outage where the sun passes directly behind the satellite. At certain times of year, approximately one month either side of the spring and autumn equinoxes, there may be a conjunction of the sun and satellite positions. Depending upon the size of the earth station antenna, such events can lead to a serious impairment of the space-earth link. These outages typically last only a few minutes at a time once a day with a normal worse case outage of about ten to fifteen minutes. Outages will affect each link in multi-hop circuits. For example viewers in Europe or the Indian Ocean area would be affected by an outage of first, the Atlantic satellite and then secondly, of the actual satellite feeding their antenna. Antennas should not be adjusted or re-pointed at these lost-of-signal times. The viewer should wait out the outage until the sun finishes passing directly behind the satellite.

Remote Control Problems

The remote will not turn the receiver on or off.

(1) Check batteries, replace if necessary.

(2) Is the TV tuned to the correct channel (3 or 4)?

(3) Are you using audio and video from the Receiver to the TV? If so, is your TV/Monitor set appropriately "line or video".

(4) Is there anything blocking the signal getting to the receiver from the remote? Remotes are Infrared and will not work if blocked by any object.

Receiver Problems

Receiver does not accept input on the front panel.

(1) Check to see if receiver is set to Loc level 3 or Loc 4 and reset if necessary.

Chapter 6 : Distribution of Multiple Video and Audio Services

Distribution requirements for AFRTS Radio and Television service have changed dramatically with the implementation of the PowerVu digital compression system, which provides multiple channels of TV and audio. B-MAC delivered one video service over (SATNET) and a limited number of audio services. Most AFRTS networks distributed one channel of AFRTS Television over-the-air through VHF or UHF transmitters or as a single channel over cable systems, and radio was broadcast over one or two FM and AM transmitters. Although these delivery systems are still in use today, there is a growing demand to deliver as many of the expanded services now available over SATNET and DTS to the audience as possible. This chapter addresses the three major types of multi-channel delivery systems: CATV, MMDS, and Hybrid Satellite/Off-Air reception systems.

The most commonly used multi-channel delivery method for both AFRTS TV and radio services is cable distribution. If sufficient cable bandwidth is available an expanded or medium to large cable system can be used to deliver both TV and FM radio services

Another method for delivery of multi-channel service is Microwave Multi-point Distribution System or MMDS. MMDS is an effective method of delivering multi-channel AFRTS service to authorized audience members who do not live on Military Compounds and are not served by a cable system; however it requires host nation frequency approval. In most cases AFRTS requires MMDS systems to be encrypted. MMDS systems currently in use in Riyadh, Saudi Arabia use Zenith, (Z-TAC) and MacroVision addressable encryption systems, respectively.

A third method or receiving multiple AFRTS services is through the use of a combination of off-air and direct satellite reception. This method is especially viable in Europe where the service can be received off Hotbirds 6 and 7a using a 80cm Ku TVRO.

I. DOD CATV Performance Specifications and Testing Procedures

Overview. This chapter describes DOD operated CATV systems, establishes performance standards for these systems, and promulgates standard testing procedures. This chapter may also be of use in monitoring commercial CATV systems serving DOD audiences. In the case of Commercial CATV systems, FCC regulations, Federal or Host Country law may affect the degree of regulation allowed. (Note: In the event that Host Country regulations are more stringent than DOD Specifications, Host Country regulations shall take precedence.)

a. Assumptions regarding DOD Cable Systems:

- All CATV systems utilize broadband coaxial cable technology;

- Tree and branch, or hub and spoke architecture is used;
- Systems carry NTSC television signals;
- Systems may carry FM Audio signals;
- Systems are used to carry entertainment and informational programs. No secure or classified material is carried.

b. System Characteristics:

- Forward Bandwidth:
- Minimum 54-220 MHz {300 MHz}
- Maximum 54-450 MHZ {750 MHz}

2. Reverse Bandwidth:

- Minimum 5-30 MHZ; May not be active in some systems

Table 6-1 Downstream Channel Capacity		
Frequency Band	**Frequency Range (MHz)**	**Number of Available Channels**
LO VHF	54-88	5
FM	88-108	--
FM Mid Band	120-174	9
Hi VHF	174-216	7
Super Band	216-300	14
Hyper Band	300-450 (750)	25 (75)
Totals		60 (110)

Table 6-2 Upstream channel capacity		
Frequency Band	**Frequency Range (MHz)**	**Number of Available Channels**
Sub Low*	5-30	4
*Also known as “T” channels; T-7 through T-10		

II. Discussion

CATV is a closed circuit communications system used to deliver television and audio signals. It delivers these to a select group of viewers-a military base, an individual building, an individual ship, or an individual room/compartment. Other types of signals can be carried on a CATV system such as data, telemetry, or

video conferencing. However, the primary purposes of the systems discussed here are information and entertainment. They are **not** appropriate for the transmission of signals containing sensitive or classified information.

a. Authorization

Since CATV is a closed system, it is allowed to use frequencies that have been previously authorized for over the air broadcasts. The most obvious of these are the over the air VHF television and FM radio frequencies. More critical are frequencies in the ranges of 108-137 MHz, 140-174 MHz, and 225-400 MHz. Commercial and governmental air and sea navigation, air traffic control, harbor navigation, and the U.S. Coast Guard may use these frequencies.

b. Signal Leakage

CATV is a secondary user of these frequencies, and is responsible for insuring that its use does not interfere with the primary user. This interference arises from signals leaking out of the CATV system. Signal leakage, or radiation, occurs when the physical or electrical integrity of the CATV system is compromised. This can occur due to cracked cables, haphazard connections, vandalism or unauthorized connections to the system. In CONUS, the FCC can levy fines on “leaky” systems, or force them to abandon certain frequencies. The FCC has not been reluctant to exercise this power. (In reviewing this area, the FCC has established a figure of merit called a “Cumulative Leakage Index” which accumulates all leakage data into one measure.) DOD CATV systems must be especially aware of signal leakage requirements due to the proximity of over the air users. DOD CATV must take all steps necessary to insure that its signals do not interfere with other frequency users.

c. Signal Quality

Perceived signal quality at any location can be simplified to consist of two major factors: first signal strength, and second signal quality. Signal strength is a simple measurement, but signal quality is a more complex issue. If the wrong value of tap has been used at a location, the signal delivered to the television may be too weak to deliver a good picture. Similarly, if too much drop cable is used, excessive attenuation could be introduced, dropping levels to an unacceptable level. In situations like these, using different components can allow sufficient signal levels to be delivered. If this has been tried with limited success, additional amplification may be needed. This amplification must be placed at the proper location in the system if any benefits are expected. Signals must be amplified before levels have dropped so far that quality is affected. CATV amplifiers cannot improve signal quality; they can only amplify signal levels. A noisy signal, amplified, is not going to be a better signal. It is going to be a more powerful, noisy signal. The key is to amplify the signal when the relative level of the signal is well in excess of the level of noise and any other distortions. CATV amplifiers themselves, add noise and distortion to the signals, a fact that the system designer must take into account.

Table 6-3 Performance Standards for Acceptable CATV Operations

Standard	Requirement
Signal levels at subscriber set	3-10 dBmV
Carrier levels	
Single channel video vs. audio levels	Audio carrier shall be 15 dBmV +/- 2 dB below associated video carrier
Single channel video carrier	Shall vary no more than 12 dB in any 24 hour period
Adjacent channels	Video carriers will be within 3 dB of any adjacent channel video carriers
All channels	Video levels will be maintained so that the maximum difference across all channels will be 10 db for systems up to 300 Mhz, with 1 db allowed for each additional 100 MHz, or portion; i.e. 300 – 400 MHz would allow 11 db maximum variation.

Distribution System Performance

Carrier to Noise (C/N)	Any channel, greater than or equal to 43 dB
Hum modulation	Any channel less than or equal to 4%
Hum modulation at power frequencies	Any channel less than or equal to 3%
Cross modulation	Any channel greater than or equal to 53 dB
Composite triple beat	Any channel greater than or equal to 53 dB
Signal Leakage (Radiation)	
Frequencies less than or equal to 54 MHz	15 mV/meter measured 100 ft. from the system
Frequencies between 54 MHz and 216 MHz	20 mV/meter measured 10 ft. from the system
Frequencies greater than or equal to 216 MHz	15 mV/meter measured 100 ft. from the system

d. System Constraints

In most non-commercial DOD CATV systems, channel loading is usually light, limited to a few of the VHF frequencies. In systems of this type, perceived signal quality is most affected by: Signal Levels, Carrier to Noise, Hum Modulation, and to a lesser degree, by distortions like Cross Modulation and Composite Triple Beat. In more heavily loaded systems, Cross Modulation and Composite Triple

Beat become increasingly more important. This is because these distortions arise from the mixing of signals in the CATV system. As the number of signals increases, the distortion products also increase. Navy ships are in a unique position as they have a lightly loaded system when under way, but can have a heavily loaded system in port, if commercial CATV is available on the pier.

III. Testing Procedures.

Attachment 1 presents the approved methods for testing CATV systems to show performance conforming to the following standards. The National Cable Television Association (NCTA), the CATV industry association in the United States, have developed these procedures. The DoD has determined that these procedures reflect good engineering practice in the CATV industry, and has included them here with the NCTA's permission. Please note that the NCTA fully supports the following testing methods. It has chosen not to endorse any single set of absolute standards that are to be met. This is due to the wide range of types of systems in the United States, and the differing levels of standards that may be applicable. The standards presented are promulgated by DoD to define the minimum acceptable level of service for DoD CATV systems. Appendix 1 provides recording forms for system tests. These are reprinted with the permission of the Society of Cable Television Engineers.

Applicability of Tests

As noted above, different systems will need to place different emphasis on particular aspects of system performance. All systems must minimally monitor signal levels and signal leakage. Systems with light channel loading must also be concerned with carrier to noise and hum modulation. Systems with heavier channel loading must add composite triple beat and cross modulation to their areas of concern. If test equipment is not available, or alternate testing methods are desired, such as the use of automated test equipment, Detachments and networks should request variances within their chain of command.

Scheduling of Tests

Included here is a suggested timetable for testing. The schedule is for planned preventive maintenance. It is in addition to all demand maintenance requirements. Tests should be made at the system headend, and at, at least three locations in the distribution system, chosen to be representative of worst case expected service. Signal leakage must be monitored/checked through out the entire CATV system. Documented results of all testing should be maintained. This will allow for trend analysis, and will aid in transitioning.

As of 30 JUN 95 the FCC will allow the application of three additional standards for measurement of the performance of a cable system. These standards are set at the output of the modulating or processing equipment, which in most cases would be at the system head end.

Parameter	Requirement
Chrominance-luminance delay inequality chroma delay	Less than 179 nanoseconds
Differential gain	+/- 20%
Differential phase	+/- 10 degrees

The standards are:

Note: the FCC only requires testing demonstration this performance be completed every three years.

Parameter	Frequency		
	Continuously	Weekly or Monthly	Annually
Signal levels	X	X	X
Signal leakage	X	X	X
Carrier levels		X	X
Hum modulation		X	X
Carrier to Noise		X	X
Cross modulation		X	X
Composite T Beat		X	X

Digital Television

Many system operators are contemplating a mix of differing signal formats including NTSC, Encrypted NTSC, Digital, and HDTV on a single cable system. Although some assumptions are well accepted (e.g. digital signal will be able to be run acceptably at much lower max signal levels than NTSC) overall system performance may be affected by the overall channel loading/channel mix.

IV. Out of CONUS CATV

As noted earlier, Host Country regulations and requirements should be determined. The most stringent requirement shall take precedence.

V. Commercial CATV.

As noted earlier, Commercial CATV operators, serving DOD audiences in CONUS locations, may be subject to additional/different technical requirements promulgated by the FCC or Federal law. Readers are strongly encouraged to familiarize themselves with all local franchises/agreements concerning CATV at their location. They may then check through appropriate channels for guidance on federal policy and law.